

Appendix E

Human Health Risk Assessment Tables: Shower Exposure Model

TABLE E-1 SHOWERING MODEL INPUT PARAMETERS

Parameter Code	Parameter Definition	Units	Adult Resident Value
VR	Ventillation Rate	L/min	20
BW	Body Weight	kg	70
EF	Exposure Frequency	event/yr	350
ED	Exposure Duration	yr	30
AT-NC	Averaging time - Noncancer	days	10,950
AT-C	Averaging Time - Cancer	days	25,550
	Parameters in the Shower Model		Value
	Liquid Phase t.c. CO2	cm/h	20
	Gas Phase t.c. H2O	cm/h	3,000
	Water Viscosity at 20C	cp	1.002
	Water Viscosity at 45C	cp	0.596
	Shower Temp	K	318
	Droplet Diameter	mm	1
	Drop Time	s	2
	Shower Flow Rate	L/min	20
	Shower Stall Volume	m ³	6
	Shower Duration	min	12
	Air Exchange Rate	min ⁻¹	0.0166667
	Body Weight	kg	70
	RT	atm-m ³ /mol	0.024
	Duration in Shower Room	min	20
	Ventillation Rate	L/min	14

TABLE E-2 CHEMICAL PARAMETERS FOR SHOWERING MODEL

Chemical	Henry's Law	Molecular Weight	Gas Phase Transfer Coefficient	Liquid Phase Transfer Coefficient	Overall Mass Transfer Coefficient	Adjusted Overall Mass Transfer Coefficient
	atm-m ³ /mol-K	g/mol	cm/hr	cm/hr	cm/hr	cm/hr
ACETONE	3.90E-05	5.80E+01	1.67E+03	1.74E+01	2.35E+00	3.17E+00
BROMOFORM	6.50E-04	2.53E+02	8.01E+02	8.34E+00	6.03E+00	8.14E+00
CHLOROETHANE	1.10E-02	6.50E+01	1.58E+03	1.65E+01	1.61E+01	2.17E+01
CHLOROFORM	3.70E-03	1.19E+02	1.17E+03	1.22E+01	1.14E+01	1.54E+01
CHLOROMETHANE	2.40E-02	5.10E+01	1.78E+03	1.86E+01	1.84E+01	2.48E+01
DIBROMOCHLOROMETHANE	8.50E-04	2.10E+02	8.78E+02	9.15E+00	7.07E+00	9.55E+00
M&P XYLENES	7.30E+03	1.10E+02	1.21E+03	1.26E+01	1.26E+01	1.71E+01
METHYL-T-BUTYL ETHER	5.90E-04	8.50E+01	1.38E+03	1.44E+01	1.01E+01	1.36E+01
METHYLENE CHLORIDE	2.20E-03	8.50E+01	1.38E+03	1.44E+01	1.29E+01	1.75E+01
N-BUTYLBENZENE	1.30E-02	1.30E+02	1.12E+03	1.16E+01	1.14E+01	1.54E+01
P-ISOPROPYLTOLUENE	NA	NA	#VALUE!	#VALUE!	#VALUE!	#VALUE!
TERT-BUTYLALCOHOL	NA	NA	#VALUE!	#VALUE!	#VALUE!	#VALUE!
XYLENES	7.30E+03	1.10E+02	1.21E+03	1.26E+01	1.26E+01	1.71E+01

Henry's Law and Molecular Weight information from www.epa.gov/region09/waste/sfund/prg/s5_02.htm

TABLE E-3 SHOWERING CALCULATIONS FOR VOLATILE ORGANICS

Chemical	RME Groundwater Concentration	Concentration Leaving Shower Droplet	Indoor VOC Generation Rate	Inhalation Exposure Per Shower
	ug/L	ug/L	ug/m3-min	mg/kg/shower
ACETONE	5.05E+00	5.07E-01	8.45E-01	2.22E-05
BROMOFORM	3.00E+00	7.13E-01	1.19E+00	3.12E-05
CHLOROETHANE	6.00E-01	3.09E-01	5.15E-01	1.36E-05
CHLOROFORM	2.30E+01	9.23E+00	1.54E+01	4.04E-04
CHLOROMETHANE	2.42E+00	1.36E+00	2.27E+00	5.96E-05
DIBROMOCHLOROMETHANE	5.00E-01	1.36E-01	2.27E-01	5.98E-06
M&P XYLENES	3.00E-01	1.30E-01	2.17E-01	5.71E-06
METHYL-T-BUTYL ETHER	1.03E+00	3.76E-01	6.26E-01	1.65E-05
METHYLENE CHLORIDE	2.00E-01	8.82E-02	1.47E-01	3.87E-06
N-BUTYLBENZENE	1.00E-01	4.02E-02	6.70E-02	1.76E-06
P-ISOPROPYLTOLUENE	2.00E-01	#VALUE!	#VALUE!	#VALUE!
TERT-BUTYLALCOHOL	5.10E+00	#VALUE!	#VALUE!	#VALUE!
XYLENES	3.00E-01	1.30E-01	2.17E-01	5.71E-06